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TITLE

TESTS WITH PENETRATING SPRAYS AGAINST THE MOUNTAIN PINE BEETLE IN LODGEPOLE AND WHITEBARK PINE 1940-41 GRAND TETON NATIONAL PARK

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To: F. C. Craighead, in Charge, Forest Insect Investigations

From: James C. Evenden, in Charge, Coeur d'Alene Laboratory

Subject: Report on Penetrating Sprays

Enclosed is a report by Mr. Archie L. Gibson entitled "Tests with Penetrating Sprays Against the Mountain Pine Beetle in Lodgepole and Whitebark Pine, 1940-41, Grand Teton National Park." Your comments would be appreciated.

Copies are being sent to Miller and Keen, and a copy is being routed to the eastern stations.

James C. Evenden

Enclosure

TESTS WITH PENETRATING SPRAYS AGAINST THE MOUNTAIN PINE BEETLE IN LODGEPOLE AND WHITEBARK PINE 1940-41 GRAND TETON NATIONAL PARK

Introduction

In the search for cheaper and more effective penetrating sprays for use on brood of the mountain pine beetle in lodgepole and whitebark pine, many oil-base sprays have been tested and a number found effective. Tests of the sprays, however, have been almost entirely confined to the spring and early summer. It is considered important that possibilities of use of penetrating sprays for fall control be investigated in order to determine their field of usefulness.

In addition to testing for fall control, the use of emulsions in place of oil-base sprays offered possible economy under certain conditions provided they were found effective. With the preceding two objectives in view, a series of experiments were run at Grand Teton Park in lodgepole pine and a second series in whitebark pine at Mt. Washburn in Yellowstone National Park.

Tests in Lodgepole Pine

For the four fall control experimental tests at Grand Teton Park in 1940, 19 trees were selected. One-half of the infested base of each tree was sprayed to a height of about five feet, the unsprayed half serving as a check. Besides marking the treated area with laths each tree was blazed and numbered with crayon on the exposed sapwood. Additional measures to prevent loss of these trees was indicated because in spite of these markings many of these trees were cut, leaving only a few for examination. No trees were left of one test and some were taken from each of the other three. Data from those left are given in table 1.

Table 1 - Fall control of mountain pine beetle in lodgepole pine, Grand Teton Park - treated 9/11/40 - examined 8/11/41

Experiment	No. of trees treated 1/	Formula	Control obtained	
1	3	4 parts Diesel oil 1 part sat.sol.of naph. 2/ in orthene at 50° F. (3 lb. per gal.)	Complete	
2	2	4 parts Diesel oil 1 part orthene	Excellent	Less than 1 surviving insect per sq. ft.
3	4	1-1/5 gal. water 1/2 gal. orthene-naph. sol. as in exp. 1 1/2 lb. oleic acid 3 oz. triethanolamine	Unsatisfactory	An average of about 6 insects emerged per sq. ft.

1/ Number treated for each test was 5. Only those examined had not been cut.

2/ "Sat. sol. of naph. in orthene" = saturated solution of naphthalene flakes in orthodichlorobenzene

From the preceding data it is seen that oil-base sprays used in experiments 1 and 2 gave excellent results, but the one emulsion test for which data are available caused insufficient mortality. No survivors were noted from the spray used in experiment 1. Most of the survival noted in experiment 2 was at the extreme base of one tree and in an unusually thick-barked depression on the other. Elsewhere survival was less than one insect per square foot, and as they were larvae, emergence would be even less. Although the number of trees examined were too few to furnish a basis for definite conclusions, the indications are that the spray used in experiment 1 can be expected to give complete fall control and that used in experiment 2 only slightly less effective results. The emulsion did not cause sufficient mortality to be considered acceptable.

Further tests were made with emulsions the following spring with the following results:

Table 2 - Tests of emulsions against the mountain pine beetle in lodgepole pine, Grand Teton Park, 1941

Experiment	No. of logs treated	Formula	Control obtained
4	3	4 qt. water 1 qt. orthene 4 oz. oleic acid 1½ oz. triethanolamine	Average of 1.1 insects surviving per sq. ft. very good control, but one log showed unsatisfactory mortality.
5	3	4 qt. water 1 qt. orthene 50 cc. Triton #720	Unsatisfactory survival of about 7.0 insects per sq. ft.

Results with one emulsion were quite encouraging, but survival was high enough in one log to throw doubt on general effectiveness of that spray. However, further tests with that spray may show sufficient consistency in effectiveness to warrant recommending it.

Tests in Whitebark Pine

Two tests, each on six mountain-pine-beetle-infested whitebark pine, were made in late September of 1940 on the Mt. Washburn area of Yellowstone National Park, using oil-base sprays. During the following winter some unknown factor caused a drastic reduction in the number of infesting brood in untreated as well as treated material. It was also found that insufficient effect of the spray had occurred by June 28 to indicate final results. On August 20 the final examination revealed too small an amount of brood present per unit of area on which to base a definite conclusion, but the indications were that very good control had been obtained. For that reason the tests should be repeated. Notes from the two tests are given in table 3.

Table 3 - Tests of oil-base sprays against the mountain pine beetle in whitebark pine, Mt. Washburn, Yellowstone Park, 1940-41

Experiment	No. of trees examined 1/	Formula	Control obtained
6	6	4 parts Diesel oil 1 part sat. sol. of naph. in orthene (3 lb. per gal. at 50° F.)	Excellent, but based on insufficient brood. 1 survivor in 2.5 sq. ft. treated area. 13 survivors in 2.75 sq.ft. untreated area.
7	6	4 parts Diesel oil 1 part of orthene	Complete, but based on insufficient brood. No survivors in 3.25 sq.ft. treated area. 20 survivors in 2.75 sq.ft. untreated area.

1/ Only two trees in each of experiments 6 and 7 had treated areas containing any brood. Remaining area, both treated and untreated, showed bark either heavily riddled and loosened by woodpecker work or other factors had caused early death of brood.

Treatments with two emulsions, applied at the same time as the oil-base sprays, were subjected to the same interfering factors, leaving so little material for examination as to make conclusions of no value.

In the spring of 1941 two tests were conducted with emulsions on the same general area and against the same beetle in the same host tree. The data are given in table 4.

Table 4 - Tests of emulsions against mountain pine beetle in whitebark pine, Mt. Washburn, Yellowstone Park - treated 6/28/41 - examined 8/19/41

Experiment	No. of trees examined	Formula	Results
8	3	4 qt. water 1 qt. orthene 4 oz. oleic acid 1½ oz. triethanolamine	Unsatisfactory control. About 15 surviving insects per sq.ft.
9	4	4 qt. water 1 qt. orthene 50 cc. Triton #720	Unsatisfactory control. About 3 surviving insects per sq. ft.

Judging from the results obtained with these two emulsions, they are not sufficiently effective to recommend their use in whitebark pine.

Conclusions and Recommendations

Oil-base sprays used against brood of the mountain pine beetle in lodgepole pine in the fall of the year gave such excellent results, on the limited material available for examination, as to indicate that treatment at that time of the year is effective. However, another test is suggested to serve as a basis for a more definite conclusion.

An emulsion failed to give satisfactory results when used in the fall against brood in lodgepole pine. Similar sprays tested in the spring gave better results, but further tests are necessary to definitely establish their value.

In whitebark pine some factor prevented sufficient brood survival in check material to furnish a basis for a definite conclusion as to the effectiveness of fall spraying, but there were indications of excellent control on the limited material available for examination. Insufficient bark was left on trees treated with emulsions to furnish a basis for conclusions. Emulsions tested in the spring gave unsatisfactory results, indicating they are ineffective against the mountain pine beetle in whitebark pine at that time of the year.

The oil-base sprays show so much promise of being effective for fall control in both lodgepole and whitebark pine that further tests are suggested with not only the same but also less concentrated sprays. At some future time further tests of emulsions are suggested for spring and summer control in lodgepole pine, with similar tests in whitebark pine a secondary consideration.